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... 25, 1978

... Secretary for Defense Programs

... TD-4, K. F. Fasularo, TD-9, A. K. Charmatz, ...-1

SUBJECT: U. S. WEAPONS EXPERIENCE

SYMBOL: TD-9:78-6

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U.S. WEAPONS EXPERIENCE (u)

IAF-270

The following six examples show the consequences of the 1958-1961 Moratorium on U.S. weapons in stockpile during the period and also on Phase 2 and Phase 3 programs then under development.

[redacted]

DOE b(3)

He-3 Effects

Before the Moratorium of 1958-1961, all LASL tests of hollow-boosted primaries had been conducted with zero age gas; i.e., gas mixtures in which He-3, the decay product of T, was present only in minute quantities. At that time, it was the opinion of management and most designers that the actual test of primaries with aged gas was predictable and therefore of low priority.

[redacted]

DOE b(3)

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[redacted]

DOE 6(3)

Nuclear testing was necessary, however, to certify this. We simply did not know what the problem was.

[redacted]

From examination of the testing record, we believe that LLL experienced similar surprises after deployment of the W45. However, we believe that LLL would have the more vivid memory of the details, and we recommend that LLL be invited to comment.

[redacted]

Without the benefit of testing, the error very well might have propagated, undetected.

[redacted]

One-Point Safety

In 1958 first production units were completed for four weapons systems, B39 Mod 1, W28, B36Y1X2 and W34. One-point safety tests for their implosion systems had been conducted in 1955-58 and safe pit designs had been envolved for stockpile.

[redacted]

Each of the four above systems had been tested for safety by firing a normal

detonator, and had been found to be safe.

DOE b(3)

In the case of the B28 we were able to retrofit with a safer pit only as the result of a happy coincidence.

DOE b(3)

The 1959 discovery (of sensitivity to location of the point of detonation) was made as the result of continued study of the anamolous test data collected in 1955-58.

DOE b(3)

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Cyclotol vs 9404

Implosion systems were developed during 1957-58 for the W30, B41, B53, W53, and W52. [redacted] DOE b(3)

During the 1958-1961 Moratorium two accidents involving the explosive 9404 occurred at Los Alamos. As a result, the laboratory decided to discontinue use of this explosive in systems of large size [redacted] and to substitute the less sensitive and less energetic explosive cyclotol in its place. DOE b(3)

[redacted] DOE b(3)

New pit designs were released in 1960 and 1961 and pit FPU dates occurred during 1960-1962. Nuclear testing was resumed underground at NTS on 9/15/61. [redacted]

DOE b(3)

[redacted] DOE b(3)

W45

[redacted] DOE b(3)

W47 and W56

[redacted] DOE b(3)

It is of interest to recall that the Eisenhower Moratorium of 1958-1961 was instigated by the statement of the USSR that they would stop testing. The U.S. followed suit. [redacted] DOE b(3)

Beginning September 15, 1961, the two U.S. weapon laboratories and the Department of Defense took more than one year to conduct 45 tests. Thus by this measure of the number of tests, the strategy of moratorium during which they continued extensive preparation (and eventual sandbagging) gained more than one year in development time for the USSR, relative to the U.S.

Because of this experience, it has always been very difficult for us to believe that the Eisenhower Moratorium contributed one iota to either U.S. security or to a reduction in the arms race.

We believe that the task of listing the benefits of this moratorium should be imposed upon ACDA. The history is there. The lessons should be delineated.

In addition to the above six examples of U.S. problems connected with the moratorium, there have been many post moratorium design problems that were only discovered through nuclear testing. Those connected with nuclear design will be covered in a separate memo. We are, however, including six examples of vulnerability and effects problems that have only been revealed by nuclear testing.

Proposed Paragraph for Executive Summary

Experience has shown that our warheads and reentry vehicles must survive in hostile environments that frequently change as our perception of Soviet defense capability improves. Weapon effects tests at NTS are used to assess the reliability of our warheads against these evolving enemy defenses. The experiments have revealed major deficiencies in our designs and allowed corrective measures to be taken. Many of the defects were unexpected and could not have been revealed except by full scale testing. Because we made corrections, we have an increased confidence in the ability of our tested systems to perform their required missions. In attack scenarios, x-ray fluences are too high for simulation except with a nuclear weapon as the source. Although many neutron attack scenarios can be simulated using pulse reactors, other engagements involve neutron pulse widths that are orders of magnitude too narrow for any foreseeable pulse reactor to simulate. Thus we have to this time been quite dependent upon nuclear testing to display the Achilles' Heels of the survivability of our weapon systems.

Discussion

In our support of Phase 3 programs (especially), it is clear to those who do R & E work that the using services do take survivability seriously. They consider assurance of a design yield under benign conditions necessary but not sufficient.

It is true that we know a great deal about the physics of neutron and x-ray interaction with materials; so also does TD-Division know how bombs work.

However, just as the weapon designers need experiments to display the unexpected results, so do the scientists who work in the area of vulnerability and effects. Just as TD-Division and their counterparts at LLL have put warheads into the stockpile that didn't perform as expected, so have there also been close calls in the area of V & E.

[redacted]

These effects were all unexpected and wouldn't have been found except by means of NTS tests.

It is true that we can pay a weight and performance penalty and provide additional hardening, for a conservative design, but only for effects and phenomena that we already know about. In the community, we call the unexpected disasters "Achilles' Heels." We've met them before and, without testing, we cannot guarantee that we won't meet them again.

January 25, 1978

Memo TD-4:78-3 includes a brief (two pages of 17) summary of V & E and a CTB. However, in the latest document (over 40 pages long) the V & E section has been deleted and a single V & E table (with errors) has been substituted. This seems an unfortunate failure to describe an important area. We believe a brief two pages of text on V & E (such as those in TD-4:78-3 and here) could be accommodated in the supporting document and would describe better the importance of NTS testing to design and certification of reliability of our hardened weapon systems.

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